MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

Prevention of Significant Deterioration Air Permit
issued to the
University of Massachusetts–Amherst Campus
for the
University of Massachusetts Central Heating Plant
PSD Permit Number 050-026-MA11; Revision 1

Pursuant to the provisions of the Clean Air Act ("CAA"), Subchapter I, Part C (42 U.S.C. Section 7470, *et. seq*), the Code of Federal Regulations ("CFR") Title 40, Section 52.21, and the April 11, 2011 Agreement for Delegation of the Federal Prevention of Significant Deterioration ("PSD") Program by the United States Environmental Protection Agency, Region 1 ("EPA") to the Massachusetts Department of Environmental Protection ("MassDEP"), the MassDEP is issuing Revision 1 to *Prevention of Significant Deterioration* Air Quality Permit No. 050-026-MA11 for the University of Massachusetts Central Heating Plant. PSD Permit No. 050-026-MA11 was issued by EPA on October 29, 2008.

The UMass–Amherst Central Heating Plant consists of a combustion turbine ("CT") rated at approximately 10 mega-watts, a heat recovery steam generator with a duct burner rated at 91.8 million British thermal units ("MMBtu") per hour, and three boilers sized between 156 MMBtu/hr and 173 MMBtu/hr. There is also a 900 kilowatt emergency generator at the CHP rated at 1,357 horsepower and 9.13 MMBtu/hr heat input.

The design, construction and operation of the UMass–Amherst Central Heating Plant shall be subject to the attached revised permit conditions and permit limitations. This revised permit shall be effective 30 days after the date of signature and shall remain in effect until rescinded by or surrendered to MassDEP. This revised permit does not relieve UMass–Amherst from the obligation to comply with applicable state and federal air pollution control rules and regulations. All terms and conditions of the revised permit are enforceable by EPA, MassDEP and citizens under the CAA.

This final document copy is being provided to you electronically by the Department of Environmental Protection. A signed copy of this document is on file at the DEP office listed on the letterhead.

12/19/2013

_____
Marc Simpson, Chief
Air Quality Permit Section

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Date of signature

Massachusetts Department of Environmental Protection
Prevention of Significant Deterioration Air Permit Revision
University of Massachusetts – Amherst Campus
Central Heating Plant

Permit Terms and Conditions

Background for informational purposes:
On October 29, 2008, EPA-Region 1 ("EPA") issued a Prevention of Significant Deterioration ("PSD) Permit Number 050-026-MA11 to the University of Massachusetts for the construction of a Central Heating Plant ("CHP") located at 200 Mullins Way in Hadley, Massachusetts, which is part of the UMass–Amherst Campus. This PSD permit established emission limits on particulate matter less than 10 microns ("PM_{10}") and was an update to an earlier PSD permit issued by EPA dated July 25, 2005.

The CHP consists of a combustion turbine ("CT") rated at approximately 10 mega-watts net electrical output ("MW"), a heat recovery steam generator ("HRSG") with a duct burner rated at 91.8 million British thermal units ("MMBtu") per hour, and three boilers (Boiler #200 rated at 173 MMBtu/hr and Boilers #300 & #400 rated at 156 MMBtu/hr each) each producing approximately 125,000 pounds of steam per hour. There is also a 900 kilowatt emergency generator at the CHP rated at 1,357 horsepower and 9.13 MMBtu/hr heat input burning either natural gas or ultra low sulfur distillate oil ("ULSD"). The CT and three boilers are equipped with selective catalytic reduction ("SCR") systems to reduce the emissions of nitrogen oxides ("NOx") and with oxidation catalysts to reduce the emissions of carbon monoxide and volatile organic compounds.

On September 30, 2010, UMass–Amherst submitted to EPA a PSD Application for modified operation of the CHP that proposed removing the emission limits for ammonia from the CT and the boilers. Ammonia is used as a reactant in the SCR control system. Ammonia can act as a precursor to the formation of PM_{10} when higher-sulfur content fuels are used, via the reaction of ammonia with sulfur oxides to form ammonium sulfate particulate matter. However the contribution of ammonia in the flue gas to PM_{10} formation becomes insignificant when ultra low sulfur diesel oil ("ULSD"; sulfur content < 0.0015%) or natural gas are the only fuels used, as is the case at the CHP.

On May 22, 2013, MassDEP issued a Plan Approval in accordance with 310 CMR 7.02 to UMass–Amherst for a modification to the existing CT which will consist of replacing CT parts with up-rated replacement components that will result in increased fuel efficiency and greater power output. A corrected version of this Plan Approval was issued on June 14, 2013.

This modification will increase the CT PM_{10} emission rate from 4.14 lb/hr to 4.73 lb/hr while burning natural gas, and from 4.71 lb/hr to 5.74 lb/hr while burning ULSD oil. The "lb/MMBtu" emission rates will remain unchanged for both fuels at 0.030 lb/MMBtu while burning natural gas and at 0.036 lb/MMBtu while burning ULSD oil. The potential PM_{10} emissions from the unmodified CT (w/o duct burner) was 18.7 tons per year, and the potential PM_{10} emissions from the up-rated CT (w/o duct burner) will be 21.8 tons per year, for an increase in potential emissions of 3.1 tons per year.

Table 1 documents the net change in PM_{10}, SO_2, NOx, CO, VOC and CO_2e emissions associated with the up-rated CT replacing the original CT. As shown, the operation of the up-rated CT will not result in a significant emission increase for any of the criteria pollutants and thus is considered a non-major modification of an existing PSD permit.

Table 1 – Up-Rated CT vs. CT
Net Change in Emissions

Pollutant	Proposed Up-Rated CT Potential Emissions (tons per year)(1)	CT Actual Emissions (tons per year)(2)	Net Change in Emissions (tons per year)	Significant Increase (tons per year)
PM_{10}	21.81	17.40	4.41	15 (3)
SO_2	6.37	1.16	5.21	40 (3)
NO_x	7.64	4.98	2.66	40 (3)/ 25 (4)
CO	6.89	1.43	5.46	100 (3)
VOC	7.90	0.26	7.64	25 (4)
CO_2 e	74,072.	66,361.	7,711.	75,000 (3)

(1) Based on the CT operating at max. load (no duct burner) firing oil for 2160 hrs and firing natural gas for 6600 hours.
(2) Based on actual emissions from the CT averaged over calendar years 2011 and 2012.
(3) Significant emission rates triggering PSD review
(4) Significant emission rates triggering non-attainment review

On May 31, 2013 UMass–Amherst submitted to the MassDEP a request to modify their September 30, 2010 PSD application to reflect the up-rated CT and increased emission limits of PM_{10} established in the May 22, 2013 (reissued June 14, 2013) MassDEP Plan Approval referenced above.

The design, construction and operation of the CHP shall be subject to the following permit conditions and permit limitations.

I. EMISSION LIMITATIONS

1. The emission rate of particulate matter less than 10 micrometers (PM_{10}) discharged to the atmosphere shall not exceed the following emission limits for each emission unit.

PM_{10} Emission Rates

Emission unit	Fuel	
	Natural Gas	ULSD oil
CT/HRSG without duct burner	0.03 lb/MMBtu 4.73 lb/hr	0.036 lb/MMBtu 5.74 lb/hr
CT/HRSG with duct burner	0.03 lb/MMBtu 7.87 lb/hr	0.036 lb/MMBtu 9.71 lb/hr
High Pressure Package Boiler (~173 MMBtu/hr; per unit)	0.02 lb/MMBtu 3.59 lb/hr	0.03 lb/MMBtu 5.21 lb/hr
Low Pressure Package Boilers (~156 MMBtu/hr; per unit)	0.02 lb/MMBtu 3.24 lb/hr	0.03 lb/MMBtu 4.68 lb/hr

Notes:
a. The lb/hr emission rates are based on worst case scenarios (100% load and 0° F ambient temperature).
b. The lb/hr and lb/MMBtu emission rates are based on a 1-hour block average.
c. Emission limits apply at all times including startup and shut down.

II. OPERATING REQUIREMENTS

2. The owner/operator shall combust natural gas or ULSD oil.

3. The owner/operator shall operate the emergency engine only during emergency situations or for routine maintenance testing. Total hours of operation for each engine shall not exceed 300 hours during any 12-month period.

4. Sulfur in natural gas shall not exceed 0.8 grains/$100ft^3$

5. Sulfur in ULSD oil shall not exceed 0.0015 percent by weight.

III. TESTING REQUIREMENTS

6. The owner/operator shall ensure that all stacks and exhaust ducts are configured so as to accommodate the emissions testing requirements stipulated in 40 CFR Part 60, Appendix A. The CT/HRSG and boiler ducts shall include two outlet sampling ports 90 degrees apart from each other. The sampling ports must be located at a minimum of one duct diameter upstream and two duct diameters downstream of any flow disturbance.

7. The owner/operator shall perform emission testing upon request of MassDEP. The owner/operator shall submit emissions test protocol(s) to MassDEP for review and written approval at least 30 days prior to the date of actual testing. The owner/operator shall submit the final emissions test report(s) to the MassDEP within 60 days after the completion of each of the tests.

8. Upon request of MassDEP, the owner/operator shall determine compliance with the PM_{10} emission limit using 40 CFR 51, Appendix M, Test Method 201 or 201A and Test Method 202.

IV. MONITORING REQUIREMENTS

9. The owner/operator shall monitor sulfur content of each new shipment of ULSD oil received. Compliance with the percent sulfur-in-fuel requirement can be demonstrated through testing (testing certification) or by maintaining a shipping receipt from the fuel supplier (shipping receipt certification) provided the testing certification or shipping receipt certification documenting the sulfur content is done in accordance with the applicable ASTM test methods (D4294-90) or any other method approved by MassDEP.

V. RECORDKEEPING REQUIREMENTS

10. The owner/operator shall maintain records of the testing certification or shipping receipt certification used to certify that each new shipment of ULSD oil complies with the percent sulfur-in-fuel requirement specified herein.

11. The owner/operator shall maintain and make available to the MassDEP upon inspection all operating and monitoring records and logs for the last five years.

12. The owner/operator shall establish a recordkeeping system with sufficient detail to document that the operation of the emergency generator does not exceed 300 hours for any rolling 12-month period.

VI. REPORTING REQUIREMENTS

13. The owner/operator shall submit to MassDEP in an acceptable format a semiannual report postmarked by January 30th and July 30th of each year, which contains for the prior calendar 6-month period the following information, at a minimum:

    a. For each period of excess emissions or excursions from allowable operating conditions, the owner/operator shall list the duration, cause (including whether it is attributable to a malfunction or emergency), the response taken, and the amount of excess emissions. Periods of excess emissions shall include malfunctions, emergency, and upsets or failures associated with the emission control system and CEMS; and

    b. A tabulation of periods of oil use.

VII. SPECIAL TERMS AND CONDITIONS

14. The owner/operator shall only burn natural gas or ULSD oil in the CT and the package boilers, and only natural gas in the duct burner.

15. The owner/operator shall tune each package boiler annually in accordance with procedures contained in EPA 340/1-83-023 “Combustion Efficiency Optimization Manual for Operators of Oil and Gas Fired Boilers” (or equivalent) with the goal of reducing air pollutant emissions to optimum levels.

16. At the time of fuel purchase, the owner/operator shall ensure that the sulfur content of the fuel used in the emergency generator (which may also burn natural gas) conforms with or is less than the then current sulfur limit applied to on-road specification oil as defined in the Code of Federal Regulations (at the time of issuance of this permit, defined in 40 CFR § 80.29(a)(i)).

IX. TRANSFER OF OWNERSHIP

17. In the event of any changes in control or ownership of the UMass–Amherst Central Heating Plant, this permit shall be binding on all subsequent owners and operators. The owner/operator shall notify the succeeding owner and operator of the existence of this permit and its conditions. Notification shall be by letter with a copy forwarded to the EPA and MassDEP.

X. SEVERABILITY

18. The provisions of this permit are severable, and if any provision of the permit is held invalid, the remainder of this permit will not be affected thereby.

XI. OTHER APPLICABLE REGULATIONS

19. The owner/operator shall construct and operate the fuel burning equipment at the Central Heating Plant in compliance with all other applicable provisions of federal and state regulations.